

Variational autoencoder

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Autoencoders - Issues

- No sampling
- Learns just compression



Encoder

□□□□ Bottleneck

Decoder



Variational autoencoder

- Autoencoder
 - with noise in bottleneck



Encoder

□□□□ Bottleneck

Decoder



Why does noise help?



Variational autoencoder – formal definition

- Encoder

- $q(\mathbf{z} | \mathbf{x}) = \mathcal{N}(\mathbf{z}; \mu_{\theta}(\mathbf{x}), \sigma_{\theta}^2(\mathbf{x})\mathbf{I})$

- Sampling $\mathbf{f} \sim q(\mathbf{z} | \mathbf{x})$

- Decoder

- $P(\mathbf{x} | \mathbf{f})$

- Approximately learns $P(\mathbf{x})$

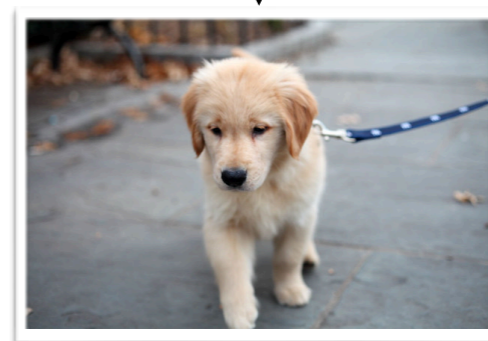
- Variational lower bound



Encoder

□□□□ Bottleneck

Decoder



Variational autoencoder - Issues

- Fails in high dimensions
 - Hard to embed spherical distributions
- Blurry outputs
 - Pixel-distance